

Cell Processes and Energy ▪ *Design Your Own Lab*

Exhaling Carbon Dioxide

Problem

Is there a relationship between exercise and the amount of carbon dioxide you exhale?

Design Skills

predicting, designing experiments

Materials

two 250-ml beakers

bromthymol blue solution (0.1% solution), 30 mL

2 straws

stopwatch or watch with second hand

graduated cylinder, 25 mL

paper towels

Procedure**PART 1 Testing for Carbon Dioxide**

1. Label 1 beaker “Beaker 1” and the other beaker, “Beaker 2.” Beaker 1 will be the control in the experiment.
2. Bromthymol blue can be used to test for the presence of carbon dioxide. To see how this works fill two 250-ml beakers with 15 mL of bromthymol solution. Label one as the control. **CAUTION:** *Bromthymol blue can stain skin and clothing. Avoid spilling or splashing it on yourself.*
3. Note and record the solution color in both beakers.
4. Place a straw in the tube. Gently blow through the straw into the solution until the solution turns color. **CAUTION:** *Use the straw to breathe out only. Do not suck the solution back through the straw.* Your partner should begin timing when you first blow through the straw and stop as soon as the solution turns color. Record the time that has elapsed.

PART 2 Exercise and Carbon Dioxide

5. In Part 1 you timed the change of color without exercising first. Predict how long it would take the solution to change color if you conduct the test after you exercise. Design an experiment to test your prediction. Be sure to include a plan for recording your results and steps to review your results.
6. Write down the steps of your experiment and get your teacher’s approval. Then, conduct your experiment. **CAUTION:** *If you have a medical condition that limits your ability to exercise, do not take part in the exercise portion of this experiment.*

Cell Processes and Energy ▪ *Design Your Own Lab***Exhaling Carbon Dioxide** *(continued)***Analyze and Conclude**

1. **Measuring** How long did it take for the solution to change color the first time you did the test (without exercising)?
2. **Drawing Conclusions** How did exercising affect the amount of time it took for the solution to change color?
3. **Predicting** What was your prediction in Step 5 based upon? Was your prediction accurate?
4. **Controlling Variables** In Part 2, what variables did you need to control? Explain how you controlled those variables.
5. **Communicating** Write a paragraph that relates the results of your experiment to the process of cellular respiration. Be sure to explain how increased cellular activity affects carbon dioxide output.

More to Explore

Some plants grow in water. How would you design an experiment that would test whether these plants produced carbon dioxide during photosynthesis? *Obtain your teacher's approval before beginning your experiment.*